E.O.M. INSTRUCTIONS

MACHINE DATA SHEET

*FAN NO.		1A	1B	2A	2B
*MACHINE NO.		1124	1125		
*MAIN SHAFT BEARING SIZE H200N2 AND NO.					
*HYDRAULIC UNIT SIZE 336 x 100 AND NO.					
FAN HOUSING INSIDE DIAMETER	INS.	147.952			
BLADE TIP DIAMETER	INS.	147.738			
BLADE TIP CLEARANCE FAN HOUSING TO BLADES IN CLOSED POSITION	INS.	.107			
ROTOR HUB DIAMETER	INS.	70.000			
NO. STAGES		1			
NO. OF BLADES PER ROTOR		16			
BLADE MATERIAL		Aluminum			
BLADE TO SHAFT CONNECTION		Bolted			
BOLTS PER BLADE		8			
HYDRAULIC BLADE POSITIONING UNIT DIAMETER AND STROKE	MM	336 x 100			
HYDRAULIC BLADE ADJUSTMENT RANGE	DEG.	45			

*IF NOT NOTED - FILL IN AT TIME OF ERECTION OR DURING PRE-START UP INSPECTIONS.

9.4 OPERATION

IF EXCESSIVE NOISE OR VIBRATION OCCURS DURING OPERATION, THE CAUSE SHOULD BE INVESTIGATED AND CORRECTED. CAUSES OF SUCH DISTURBANCES MAY BE IMBALANCE DUE TO BLADE WEAR OR HEAVY DUST DEPOSITS, BLADE CONTACT AT THE FAN HOUSING, MIS-ALIGNMENT OF MAIN SHAFT BEARINGS, INTERMEDIATE SHAFT AND COUPLINGS, OR UNDER- OR OVER-LUBRICATION OF MAIN SHAFT BEARINGS. SEE THE TROUBLE SHOOTING DIAGRAM IN SECTION 3.6.

REFER TO THE MECHANICAL VIBRATION GUIDE LIMITS IN SUPPLEMENTARY INSTRUCTION V.

CARE SHOULD BE TAKEN TO AVOID RUNNING THE FAN IN THE STALL RANGE BECAUSE OF POSSIBLE DAMAGE TO THE BLADES.

TO COMPENSATE FOR THE THERMAL EXPANSION OF THE INTERMEDIATE SHAFT (26.00) BETWEEN THE TEMPERATURE EXISTING AT THE TIME OF ASSEMBLY AND ALIGNMENT, AND THE TEMPERATURE THAT WILL PREVAIL DURING OPERATION, THE INTERMEDIATE SHAFT, FAN, AND MOTOR SIDE HALF-COUPLINGS (25.11 AND 25.12) WERE INITIALLY SET IN

E.O.M. INSTRUCTIONS

ACCORDANCE WITH THE INTERMEDIATE SHAFT THERMAL EXPANSION SYSTEM DRAWING - ATTACHED, AND ALIGNED IN ACCORDANCE WITH SUPPLEMENTARY INSTRUCTION VI.

THE PERFORMANCE PREDICTED FOR THE FANS IS AS TABULATED ON THE PREDICTED PERFORMANCE SUMMARY - ATTACHED, AND THE FAN CHARACTERISTIC CURVES, VOLUME - PRESSURE DIAGRAM - ATTACHED.

ALSO ENCLOSED ARE THE STARTING TORQUE CURVES - ATTACHED.

THE RECOMMENDED START AND STOP SEQUENCE, AND INTERLOCKS FOR THE FAN ARE OUTLINED ON THE AXIAL FLOW FAN RECOMMENDED START-STOP SEQUENCE AND INTERLOCK - ATTACHED, WHICH ALSO REFERS TO THE OIL FLOW SCHEMATIC AND LIST OF EQUIPMENT -ATTACHED.

9.5 PARALLEL OPERATION OF VARIABLE PITCH - AXIAL FLOW FANS

WHEN A SECOND VARIABLE PITCH - AXIAL FLOW FAN IS TO BE BROUGHT INTO PARALLEL OPERATION, THE FIRST FAN SHOULD BE REGULATED DOWN SO THAT ITS TOTAL DELIVERY HEAD IS LOWER THAN THE LOWEST POINT OF THE "SADDLE" OF THE STALL CURVE.

REFER TO THE CHARACTERISTIC CURVES, VOLUME - PRESSURE DIAGRAM - ATTACHED.

THE SECOND FAN TO BE BROUGHT INTO OPERATION SHOULD HAVE ITS BLADES IN THE LOWEST DELIVERY SETTING WHILE THE FAN IS NOT IN OPERATION. THE SECOND FAN SHOULD THEN BE REGULATED UPWARD UNTIL BOTH FANS DELIVER THE SAME VOLUME.

WITH BOTH FANS ON AUTOMATIC CONTROL, THEY MAY BE OPERATED TOGETHER AT ANY REQUIRED POINT BELOW THE STALL LIMIT.

TO REMOVE ONE FAN FROM OPERATION, THE DELIVERY HEAD OF BOTH FANS MUST BE REDUCED TO A POINT LOWER THAN THE LOWEST POINT OF THE STALL-CURVE SADDLE. THE FLOW OF THE FAN BEING SHUT DOWN CAN THEN BE REDUCED TO "O", WHILE THE REMAINING FAN IS INCREASED TO MAINTAIN FLOW. WHEN THE FIRST FAN HAS BEEN SHUT DOWN, THE REMAINING FAN CAN BE OPERATED ANYWHERE IN THE NON-STALL AREA.

9.6 TROUBLE SHOOTING

A DIAGRAM FOLLOWS TO ASSIST IN LOCATING THE PROBABLE CAUSES OF MALFUNCTIONS INDICATED BY:

E.O.M. INSTRUCTIONS

EXCESSIVE MAIN SHAFT BEARING TEMPERATURES

HIGH FAN VIBRATIONS

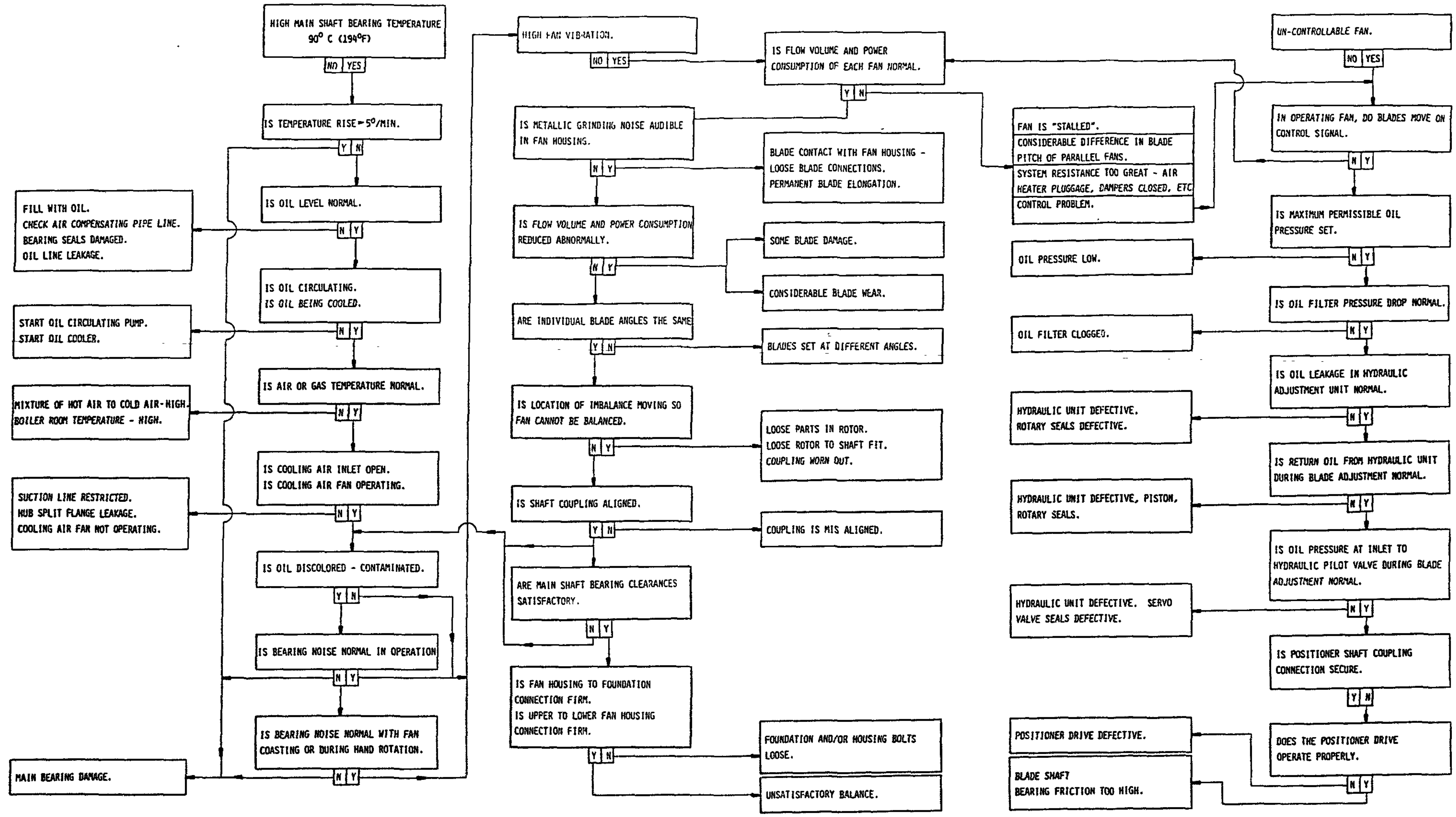
UNCONTROLLABLE FAN

THIS CHART WAS DEVELOPED BY A LARGE WEST-GERMAN UTILITY. IN USE OF THIS CHART, WE ASK THAT YOU COMMUNICATE ANY SUGGESTIONS OR IMPROVEMENTS TO TLT-BABCOCK, TECHNICAL SERVICE DEPARTMENT.

9.7 INVESTIGATING BLADE ADJUSTMENT PROBLEMS -REFER TO SUPPLEMENTARY INSTRUCTION XII.

9.8 GENERAL DATA, PERFORMANCE DATA, AND START-STOP SEQUENCES - ARE ATTACHED.

3.6 "TROUBLE SHOOTING DIAGRAM"



IP7_039066

B-TLT 70023

TLT-Babcock, INC.

CONTRACT INFORMATION SHEET

A.O.

1	**PERFORMANCE DATA** ☒ F.D. FAN ☐ I.D. FAN ☐ P.A. FAN						
2	(ALL QUANTITIES ARE PER FAN) ASSUMED BAROMETRIC PRESSURE: 25.20 IN. HG. 4676' elev.						
3	Two fan operation						
4	OPERATING POINT	1	2	3	4	5	6
5	BOILER LOAD	TB	MCR	100	75	50	25
6	INLET FLOW, M LBS/HR	4018.3	3335.6	3135.8	2461.7	1712.2	904.1
7	INLET VOLUME, MCFM	1154.7	958.5	901.1	707.4	492.0	259.8
8	INLET TEMP., F.	110	110	110	110	110	110
9	INLET DENSITY, LBS/CU. FT.	.058	.058	.058	.058	.058	.058
10	INLET PRESSURE, IN. WG.	-1.5	-1.2	-1.1	-0.7	-0.4	-0.1
11	STATIC PRESS. INCR, IN. WG.	19.5	10.9	10.0	7.2	4.83	2.97
12	DYNAMIC PRESS. AT INLET, IN. WG.	0.98					
13	LOSS FOR TURNING BEND AND DAMPER, IN. WG.	0.30					
14	LOSS FOR SILENCER INLET/OUTLET, IN. WG.	0.50					
15	TOTAL PRESS. INCR, IN. WG.	21.28	12.12	11.08	7.87	5.15	3.06
16	TOTAL DELIVERY HEAD (ADIABATIC), FT. GAS	1867	1075	984	699	460	274
17	FAN EFFICIENCY	88.0	89.3	88.0	76.5	61.0	40.0
18	POWER REQUIRED AT FAN SHAFT, HP,	4305	2027	1770	1136	652	312
19	FAN SPEED: 880 RPM Continued on C.I.S. 6B						
20	FAN TORQUE AT MAX. POINT: 25,693 FT. LBS.						
21	FAN WR^2: 30,840 LB-FT^2						
22							
23							
24							
25	DESIGN CONDITIONS BASED ON ☐ TLT-B ☒ PURCHASER SPECS FOR GUARANTEE PERFORMANCE SEE CIS-7						
26	FOR HEAD VS. VOLUME DIAGRAM SEE DWG: FOR SPEED-TORQUE CURVE SEE DWG:						

REL. NO. AND DATE 0-1/15/82

CONTRACT NO. 548-0581

PERFORMANCE DATA

CIS-6 A

IP7_039067

TLT-Babcock, INC.

CONTRACT INFORMATION SHEET

A.O.

1 **PERFORMANCE DATA** ☒ F.D. FAN ☐ I.D. FAN ☐ P.A. FAN

2 (ALL QUANTITIES ARE PER FAN) ASSUMED BAROMETRIC PRESSURE: 25.20 IN. HG. 4676' elev.

3 Single Fan Operation

#							
4	OPERATING POINT	7	8	9	10	11	
5	BOILER LOAD	MCR	100	75	50	25	
6	INLET FLOW, M LBS/HR	6671.2	6271.7	4923.5	3424.3	1808.2	
7	INLET VOLUME, MCFM	1917.0	1802.2	1414.8	984.0	519.6	
8	INLET TEMP., F.	110	110	110	110	110	
9	INLET DENSITY, LBS/CU. FT.	.058	.058	.058	.058	.058	
10	INLET PRESSURE, IN. WG.	-1.20	-1.10	-0.7	-0.4	-0.1	
11	STATIC PRESS. INCR, IN. WG.	10.9	10.0	7.2	4.83	2.97	
12	DYNAMIC PRESS. AT INLET, IN. WG.						
13	LOSS FOR TURNING BEND AND DAMPER, IN. WG.						
14	LOSS FOR SILENCER INLET/OUTLET, IN. WG.						
15	TOTAL PRESS. INCR, IN. WG.	15.81	14.34	9.87	6.12	3.33	
16	TOTAL DELIVERY HEAD (ADIABATIC), FT. GAS	1396	1266	876	549	298	
17	FAN EFFICIENCY	72.5	73.0	73.5	69.5	55.0	
18	POWER REQUIRED AT FAN SHAFT, HP.	6487	5493	2963	1366	495	

19 FAN SPEED: 880 RPM

20 FAN TORQUE AT MAX. POINT: 38,715 FT. LBS.

21 FAN WR^2: 30,840 LB-FT^2

22

23

24

25 DESIGN CONDITIONS BASED ON ☐ TLT-B ☒ PURCHASER SPECS
FOR GUARANTEE PERFORMANCE SEE CIS-7

26 FOR HEAD VS. VOLUME DIAGRAM SEE DWG:
FOR SPEED-TORQUE CURVE SEE DWG:

REL. NO. AND DATE 0-1/15/82

CONTRACT NO. 548-0581

B-TLT 70014

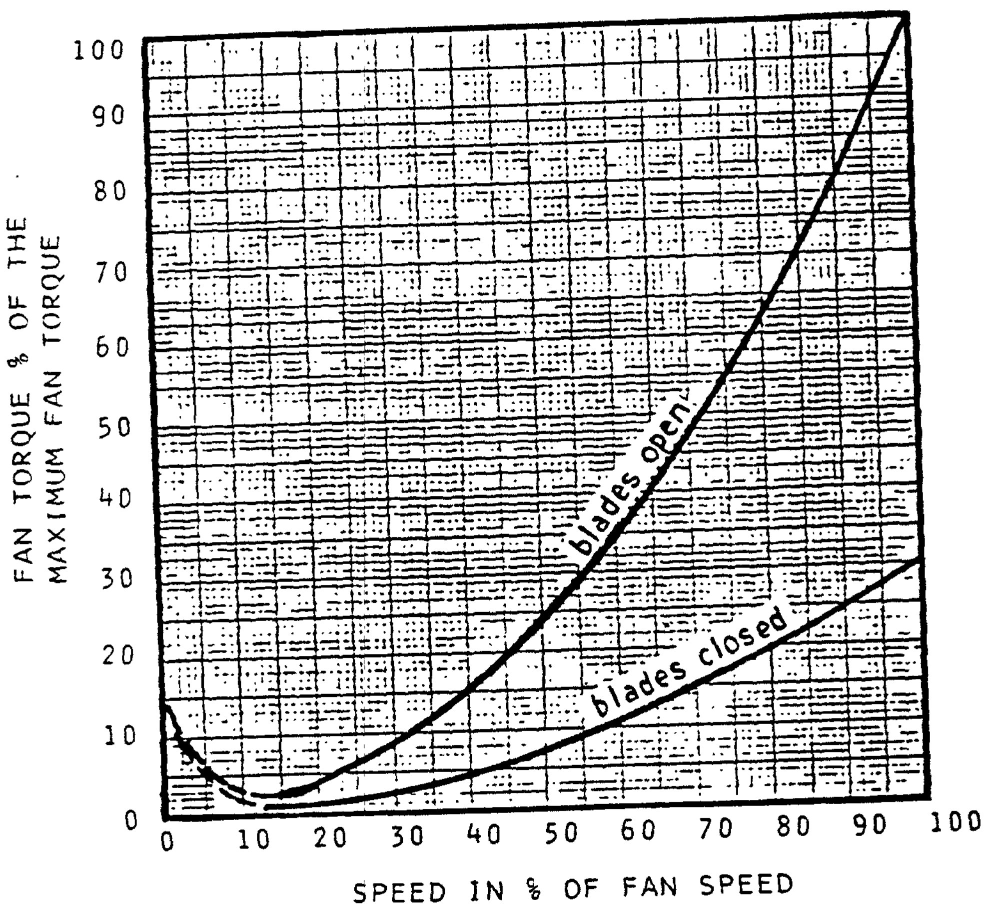
STARTING TORQUE CURVE

PREDICTED PERFORMANCE

AXIAL FLOW FAN WITH BLADE ADJUSTMENT SIZE: FAF 37.5/18-1

FAN SPEED	(N):	880/700	RPM
MOMENT OF INERTIA	(WR^2):	30,840	LB X FT^2
POWER REQ'D. @ MAX. POINT	(N):	6487	BHP
FAN TORQUE @ MAX. POINT	(M_D):	38,716	FT-LBS
MOTOR STUB RADIAL LOAD	(P_R):	2400	LBS
MOTOR STUB AXIAL LOAD	(P_A):	0	LBS

FAN PERFORMANCE CURVE:



CUSTOMER: Intermountain Power Project
Intermountain Generating Station Units 1, 2, 3 & 4
Project File 9255.62.3402
Forced Draft Fans

ENGR:

TLT-Babcock Contract No. 548-0581/0591/0601/0611

DRAWING NO. B-TLT 70014

Page no.

TLT - Babcock Inc.

IP7_039069

PERFORMANCE TEST RESULTS

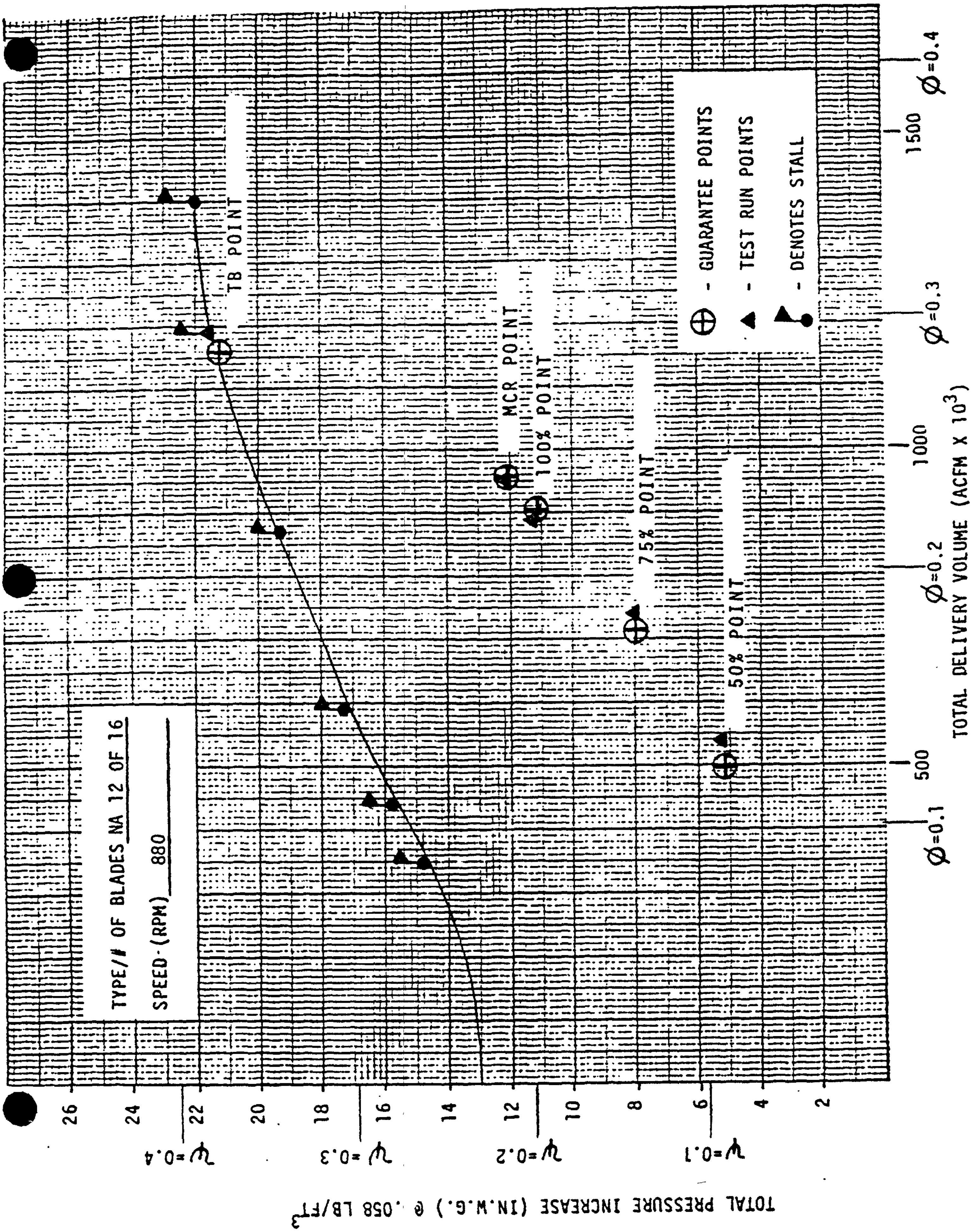
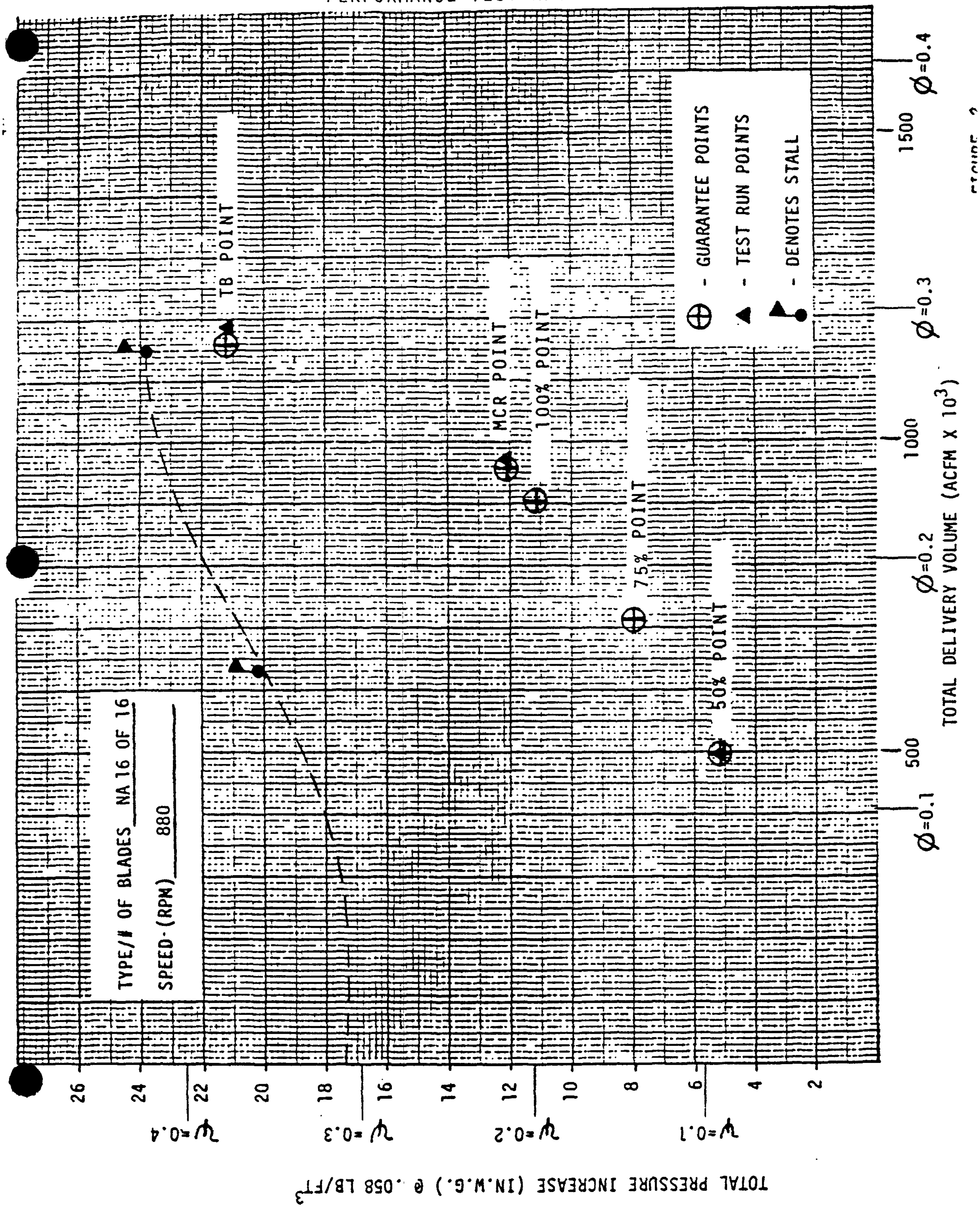
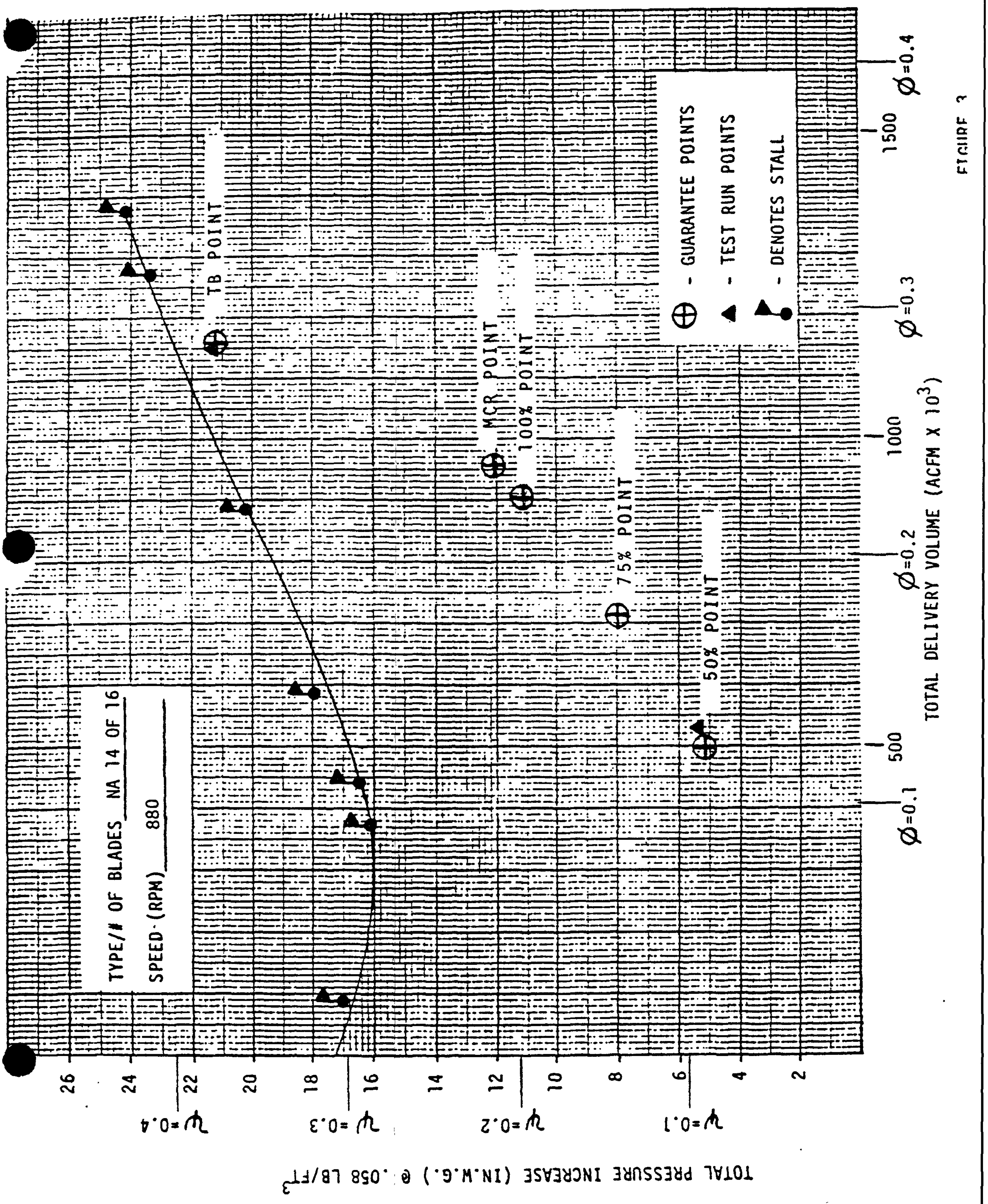


FIGURE 1

PERFORMANCE TEST RESULTS



PERFORMANCE TEST RESULTS



IP7_039072

PERFORMANCE TEST RESULTS

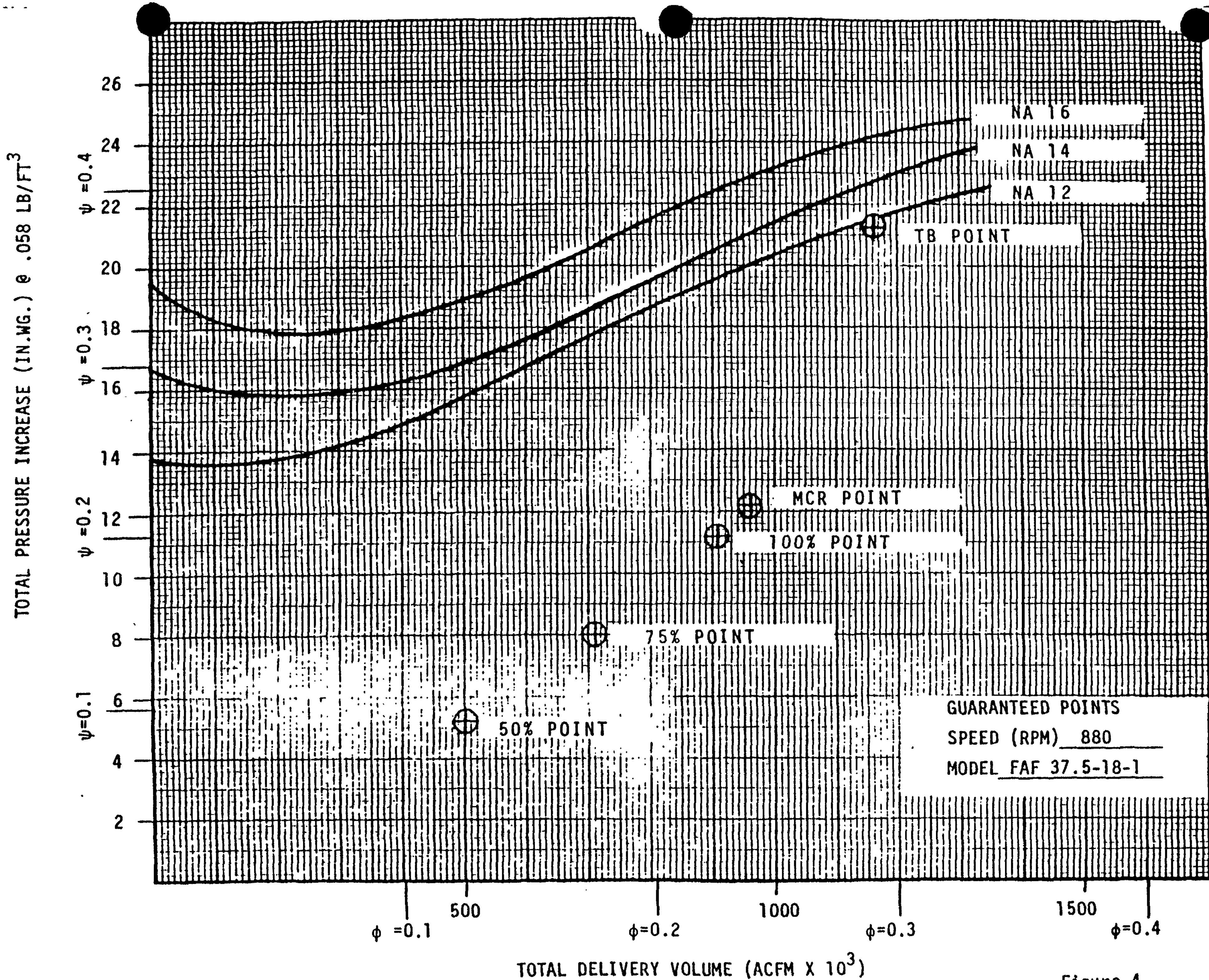
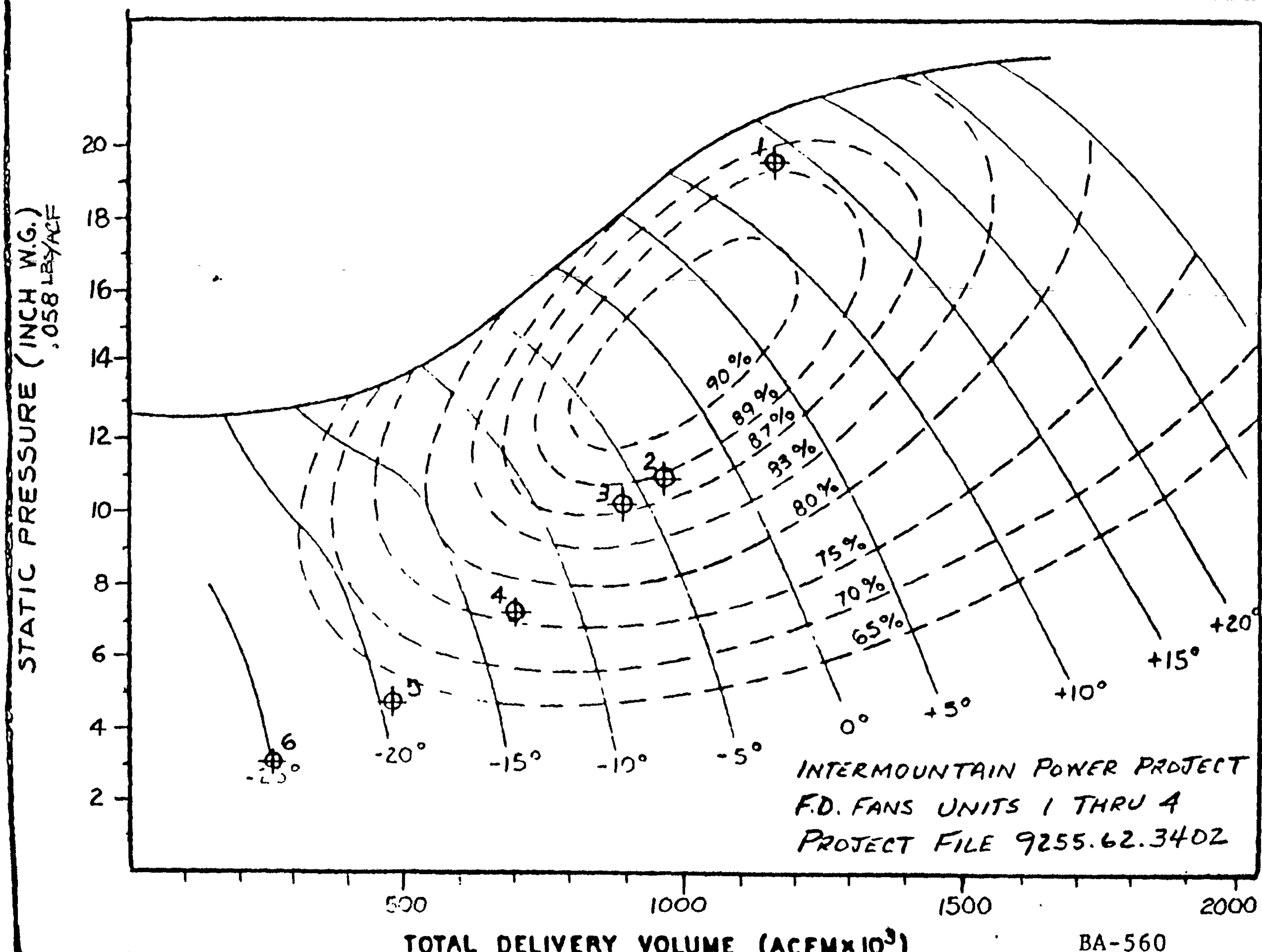


Figure 4

IP7_039073

TLT-BABCOCK, INC.
VARIABLE PITCH AXIAL FAN
PREDICTED PERFORMANCE

TYPE FAF 37.5 / 18.0 - 1
SPEED (RPM) - 880
NO. STAGES - 1
BLADE TYPE - N.A.
NO. BLADES/STAGE - 16

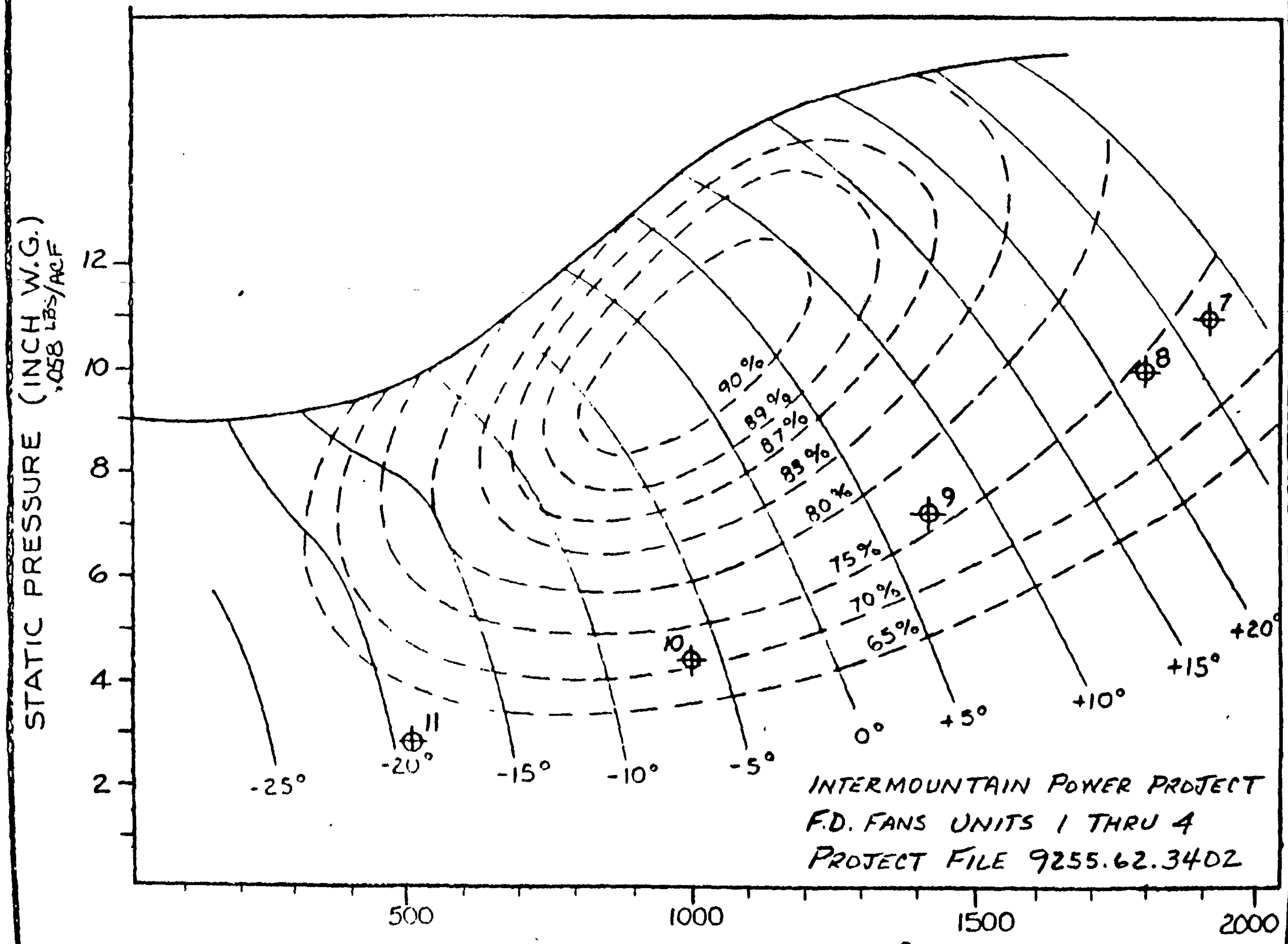


TWO FAN OPERATION

BA-560
NOVEMBER 24, 1981
Page 5-4A

TLT-BABCOCK, INC.
VARIABLE PITCH AXIAL FAN
PREDICTED PERFORMANCE

TYPE FAF 37.5/18.0-1
SPEED (RPM) - 880
NO. STAGES - 1
BLADE TYPE - N.A.
NO. BLADES/STAGE - 16

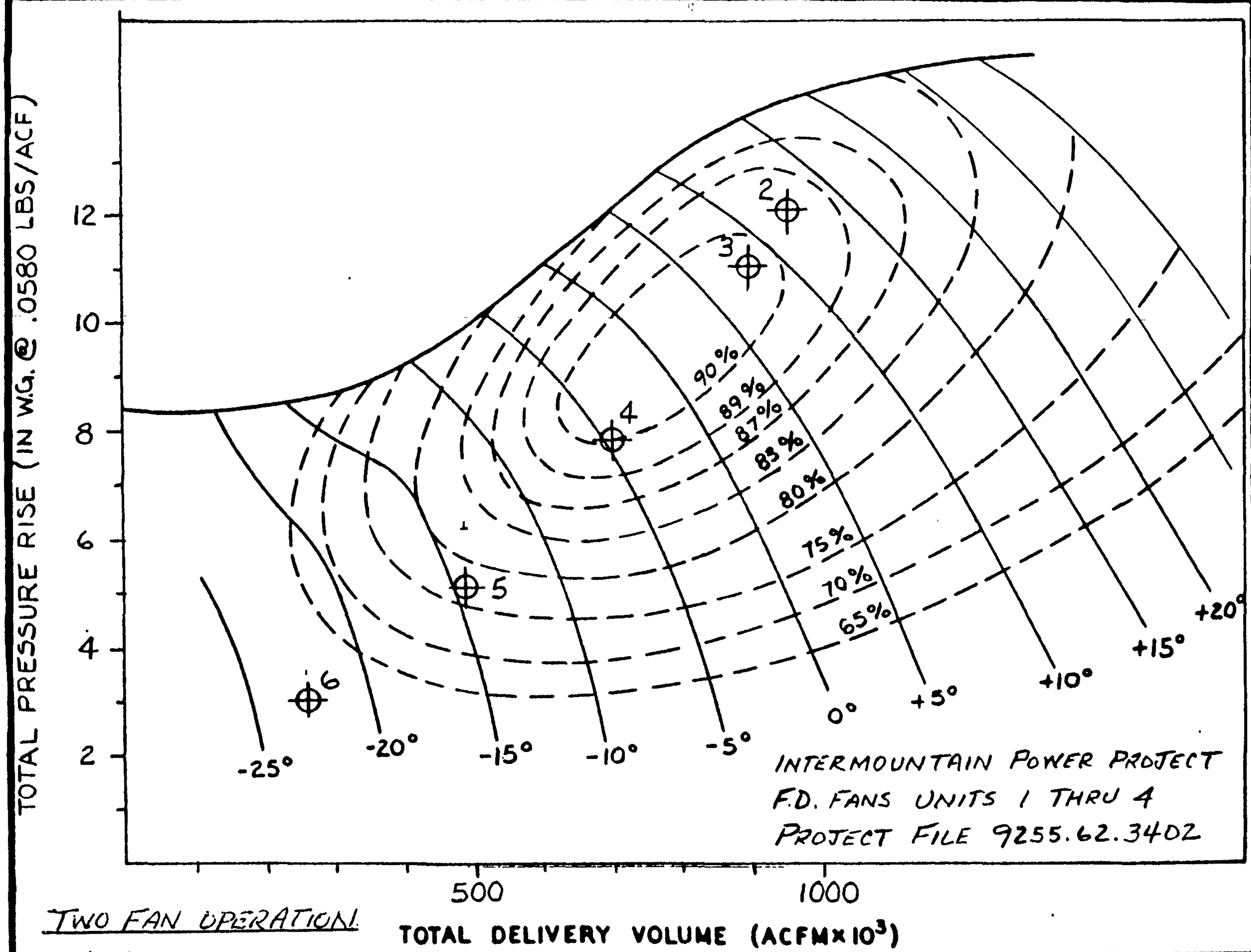


ONE FAN OPERATION

BA-560
NOVEMBER 24, 1981
Page 5-4 B

IP7_039075

TLT-BABCOCK, INC. VARIABLE PITCH AXIAL FAN PREDICTED PERFORMANCE	TYPE FAF 37.5/18.0-1 SPEED (RPM) - 700 NO. STAGES - 1 BLADE TYPE - N.A. NO. BLADES/STAGE - 16

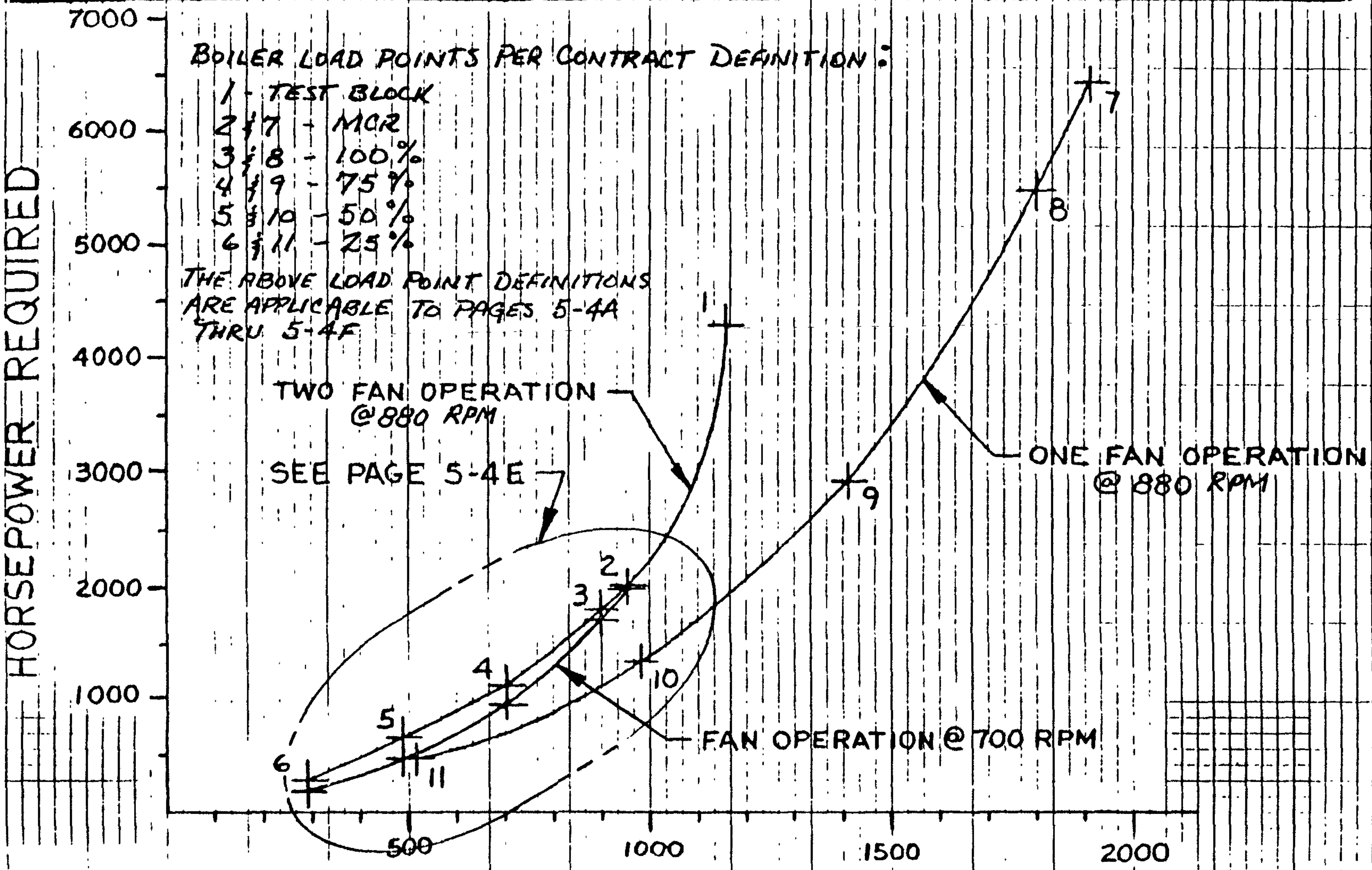


TWO FAN OPERATION

IP7_039076

TLT-BABCOCK, INC.
VARIABLE PITCH AXIAL FAN
PREDICTED PERFORMANCE

TYPE FAF 37.5/18.0-1
SPEED (RPM) - 880/700 NO. STAGES -1
BLADE TYPE -N.A. NO. BLADES/STAGE - 16



TOTAL DELIVERY VOLUME (ACFM × 10^3)

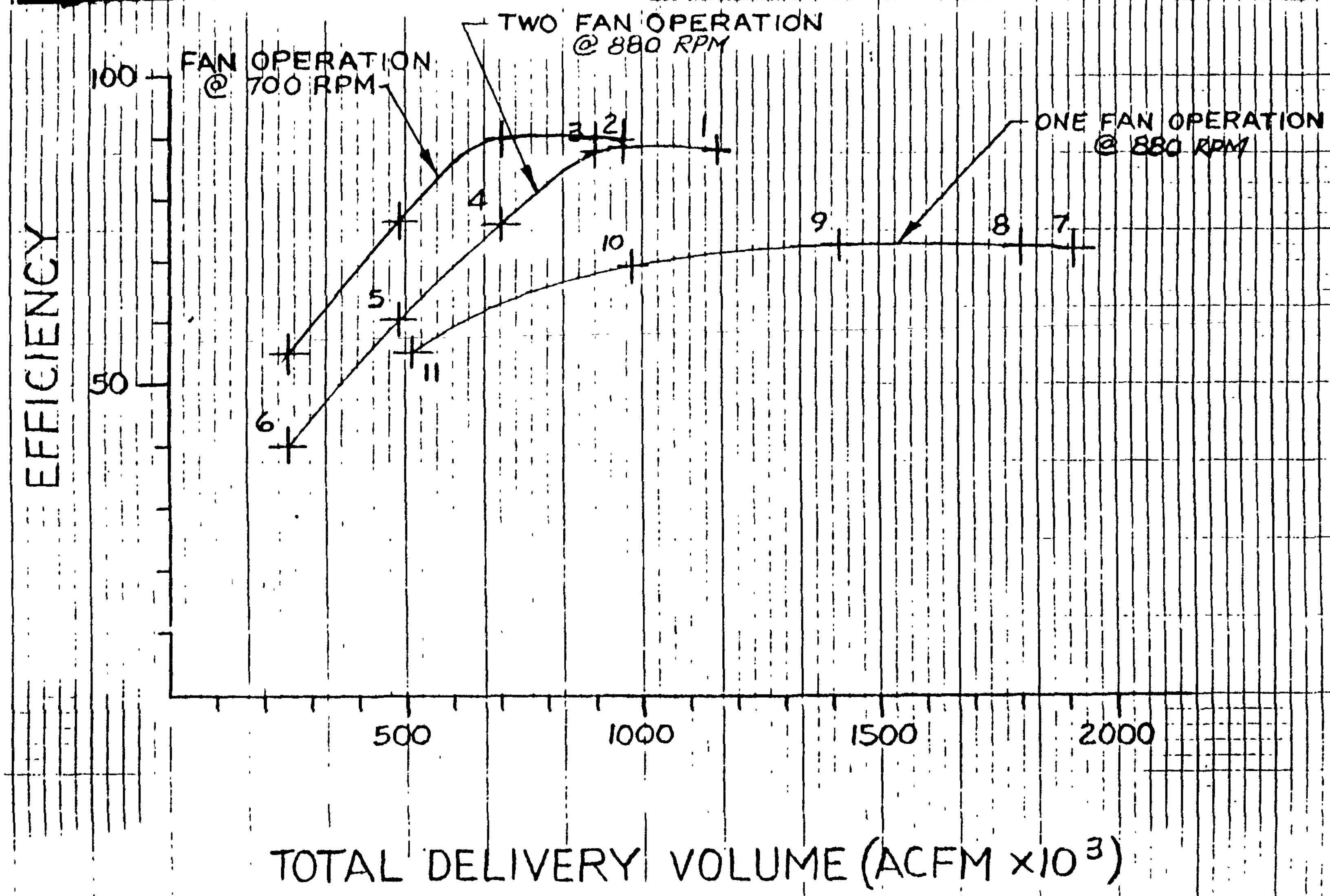
INTERMOUNTAIN POWER PROJECT
F.D. FANS UNITS 1 THRU 4
PROJECT FILE 9255.62.3402

BA-560
NOVEMBER 24, 1981

IP7_039077

46-0863

TLT-BABCOCK, INC. VARIABLE PITCH AXIAL FAN PREDICTED PERFORMANCE	TYPE FAF 37.5/18.0-1 SPEED (RPM) - 880/700 NO. STAGES - 1 BLADE TYPE - N.A. NO. BLADES/STAGE - 16

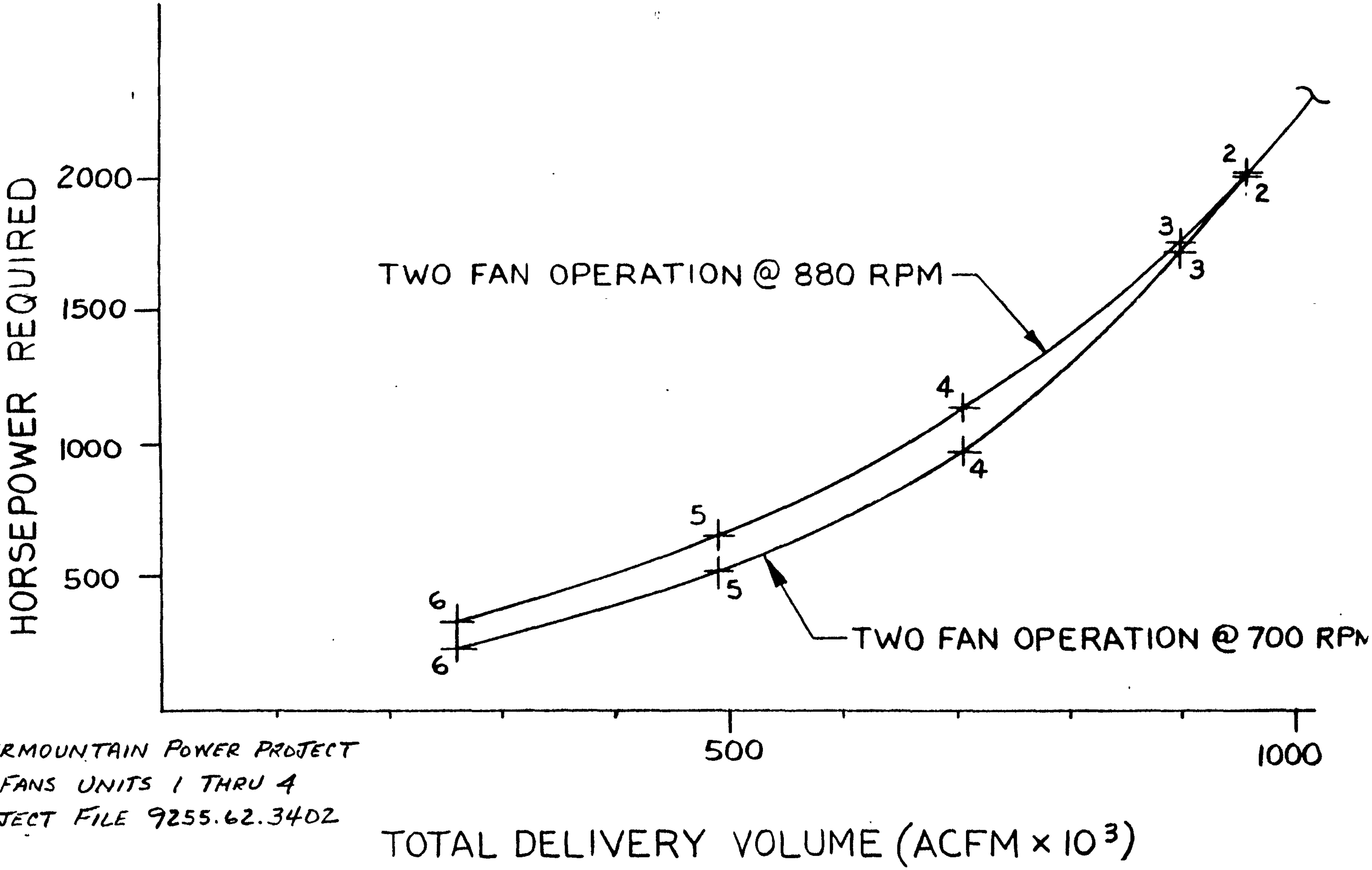


INTERMOUNTAIN POWER PROJECT
F.D. FANS UNITS 1 THRU 4
PROJECT FILE 9255.62.3402

BA-560
NOVEMBER 24, 1981
Page 5-4D

TLT-BABCOCK, INC.
VARIABLE PITCH AXIAL FAN
PREDICTED PERFORMANCE

TYPE FAF 37.5/18.0-1	
SPEED (RPM) -	NO. STAGES - 1
BLADE TYPE - N.A.	NO. BLADES/STAGE - 16



INTERMOUNTAIN POWER PROJECT
F.D. FANS UNITS 1 THRU 4
PROJECT FILE 9255.62.3402

IP7_039079

Section 16.2 Field Balancing of Heavy Duty Fan Wheels

I.B. 90-400.16.2.0.1

Centrifugal fans are normally balanced by the addition of metal weights attached to the various members of the fan Wheels. Unless specifically noted at the time of shipment, all fan Wheels are statically and dynamically balanced at the factory. However, due to shipping and handling, the precision factory balance can be disturbed and the Wheel(s) may require "touch-up" or "refinement" balance after installation. Subsequent operation in erosive or corrosive applications may also require that the fan Wheel be periodically rebalanced to offset unequal loss of Wheel material.

The method of securing the field balance weight(s) to the Wheel should be the same as that method used for the factory installed balance weight(s); i.e., bolting, welding, fitted weights in balance rings or grooves. If the factory balance weights are bolted or riveted on, it must be assumed that welding is not permitted on the Wheel and all subsequent field balance weights must be attached with rivets or bolts. However, when the factory balance weights are welded on, bolting of field balance weight(s) is acceptable if it is a more desirable method.

WARNING

WELDING ON WHEELS CAN BE DETRIMENTAL TO THE INTEGRITY OF THE WHEELS WHEN SPECIAL MATERIALS, HEAT TREATING, STRESS RELIEVING, OR OTHER PROCESSES ARE USED IN THE DESIGN AND MANUFACTURE OF THE WHEELS. WHEN IN DOUBT, CONTACT THE WSD TECHNICAL SERVICE DEPARTMENT FOR CLARIFICATION.

The proper technique of in-place dynamic balancing requires extensive technical knowledge backed by practical experience. For this reason, only qualified and experienced personnel should attempt in-place balancing. WSD is staffed with highly qualified and experienced personnel fully capable of performing this operation.

In general, before any attempts to balance are performed, the following check should be made:

a. Be sure the Rotor is clean. Remove any build-up of foreign material.

b. Be sure the Rotor has not been eroded or corroded to the point where deformation, cracking, or looseness at joints (interfaces) is affecting the stability of the Rotor.

c. Be sure the Shaft is not bent (temporary or permanent bends).

d. Be sure that all Shaft Seals are properly set and not rubbing on the Shaft.

e. Be sure Coupling alignment(s) is within allowable tolerances.

f. Be sure all Rotor support fasteners are properly installed and torqued to recommended values.

g. Be sure Bearing(s) are in good mechanical condition.

NOTE

Thermal changes may affect balance runs. Gas temperatures should be controlled to less than 35°F Differential during the entire balance operation sequences.

The following instructions cover the location, size, and method of fastening the balance weights used in most applications.

Effective January 1982

Westinghouse Electric Corporation
Sturtevant Division
Hyde Park, Boston, MA 02136